

April 1881. *Mr. Capron, The Partial Eclipse of the Sun etc.* 329

If M. Tisserand's contact either at Ingress or Egress should clearly appear to be attempts at "apparent contact," then the rejection of both the equations (5) and (6) is absolutely necessary, and the value $8''.88$ would be entitled to very considerable weight. On the other hand, should it appear that M. Tisserand's observations are at Ingress and Egress observations of the "last appearance" and "first appearance" respectively of any sensible disturbance of the illumination of the Sun's limb near the points of contact, then the value of the solar parallax given by these durations will be larger than $8''.88$; but the probable error must be considerable.

It appears from M. Tisserand's paper in the *Comptes Rendus*, No. 12, 1881, March 21, that the value of the solar parallax $8''.86$ found by Le Verrier from a discussion of the masses of the planets requires, if anything, a slight increase rather than a decrease.

The way in which all the more important investigations on the solar parallax have, when cleared from obvious mistakes, given results which group themselves around some such value as $8''.88$ is certainly remarkable. The extreme values appear to be those derived from the meridian observations of *Mars* which give some such value as $8''.95$, and the values deduced from the recent determinations of the velocity of light, with Struve's coefficient of aberration, which appear to point to some such value as $8''.80$. The difference between these values, although greater than could be wished, is not very large, and the mean agrees very closely with the mean of the values which have been obtained from the Transits of *Venus* and from the planetary and lunar theories.

The Partial Eclipse of the Sun, December 31, 1880.

By J. Rand Capron, Esq.

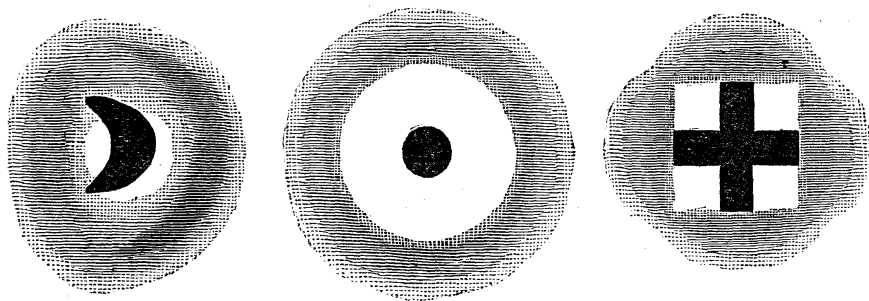
Upon examining the plates taken on this occasion, and described in the *Monthly Notices*, vol. xli. No. 3, p. 144, I have found three appearances in respect of which the photographic image differs from that seen by the eye, either unaided or with the telescope. As these are probably always, in a greater or less degree, present in photographs of similar objects, it may be useful to describe them.

1. Round the edge of the solar image, and in a stronger degree where it touches the Moon's limb, is the bright line of light seen in most photographs when black is contiguous to white. In portraiture it is well shown, edging a velvet dress, and is then frequently very sharp and definite. This effect—generally termed "photographic irradiation"—has been attributed by Lord Lindsay and Mr. Ranyard to an extension of chemical photographic action on the plate. Others, I believe, have attributed it to a thickening or building up of the chemicals

during development. Its appearance and causes have at all events been fully discussed elsewhere.

2. The second appearance not visible to the eye is a halo or ring of light seen some little distance from the Sun, and surrounding it except where the Moon's limb is in contact. Dr. Berwick, in *Nature* of October 30 and December 5, 1879, has described and figured this form of halo, as surrounding a full Moon which carried no trace of it to the eye. He was also led to infer that it was only found at full Moon, and not during the quadrants. Some experiments I made soon proved this to be a mistake. I found the same ring or halo, about a diameter distant from the object, to accompany the imperfect Moon, the Sun, and other bright bodies.

One photograph of a rising Sun shows it strong, though nothing of the sort was visible to the eye; and with the Moon images it seemed only a question of time of exposure. When by over exposure the Sun's image was reversed, the halo was so



also. As a final experiment I photographed a card with apertures in it, covered by ground-glass; and obtained the following results, in which the shading indicates the halos which were in fact soft and diffused.

The circle gives, like the Sun and full Moon in the photographs, a truly circular halo. The cross gives a somewhat more complicated image; square internally, and tending to circular externally. The crescent gives a slightly oval halo, strengthening in intensity with the shape of the crescent. Between the horns, however, there is a marked absence of the halo. I am not aware how far this ring or halo surrounding, it would seem, all bright objects when photographed has been examined and explained. At present I am inclined to think it due to the lenses with which the pictures are taken, though very similar halos are frequently seen in certain conditions of the atmosphere or the eye. These last are, however, found in practice difficult to impress on the photographic plate with a short exposure, while with a long exposure the invisible halo always comes out.

3. The last point is a diffused halo or light spreading over the dark portion of the Moon projected on the Sun. This expands from the contact edge of the Sun and Moon, gradually